TWO PUPAE OF THE PRIMITIVE SUBORDER ARCHOSTEMATA

(COLEOPTERA)

JEROME G. ROZEN, JR.[1]

Herein are described the pupae of *Micromalthus debilis* LeConte and *Cupes concolor* Westwood. *M. debilis*, with its complicated life history, is the sole representative of the family Micromalthidae. *C. concolor* belongs to the family Cupedidae consisting of several genera and a handful of species. These two families together comprise the present-day members of the suborder Archostemata, generally considered the most primitive of all groups of Coleoptera, as discussed by Böving and Craighead (1930-1931) and Atkins (1963). The pupae have not been treated taxonomically in detail heretofore, although Snyder (1913) pictured and briefly described the pupa of *C. concolor*, and Pringle (1938) and Scott (1938) did the same for *M. debilis*.

In a study of any group presumed to be ancient, it is always interesting to search for characters that might be primitive and that might therefore indicate relationships between taxa—in this case between orders. However, I cannot, with one possible exception, point out features of this sort with respect to these two species. In part this may be because we know so little about beetle pupae that primitive characteristics cannot be recognized. On the other hand, although the Archostemata separated from the other Coleoptera very early, they may have evolved both divergently from and in parallel with the others so that the pupae no longer exhibit primitive attributes.

The possible primitive feature is the sclerotized, sharp-edged mandibular teeth of *M. debilis*. This condition, though apparently not so well developed elsewhere in the Coleoptera, suggests a similar but more pronounced feature found in the Neuroptera, Megaloptera, and Trichoptera. In the latter groups the mandibles are movable and serve as a means of cutting the cocoons for emergence or of defense. The fact that the pupa of *M. debilis* possesses sensory-like setae on the labrum adds weight to the possibility that the mandibles of this species also are functional. Coleopterists finding live pupae should observe whether this is true.

The pupal mandibles of *C. concolor*, unlike those of *M. debilis*, do not have sclerotized, sharp-edged teeth though they are somewhat pigmented, and the labrum of the former is without setae. Other marked differences between the two pertain to the presence or absence of body setae and gin-traps and to such imago-reflecting characteristics as body size, elytral length and antennal length. The pupae agree in the elongate, exarate body shape, presence of a distinct pleural region on the abdomen and of a dorsal longitudinal median ridge on the abdomen, and absence of tubercles and urogomphi.

[1]Chairman and Associate Curator, Department of Entomology, the American Museum of Natural History, New York, N. Y.

The pupae of *C. concolor,* but not of *M. debilis,* exhibit modifications (fig. 7) resembling gin-traps (Hinton, 1946). These structures, formed by the anterior and posterior edges of the lateral parts of the terga, are similar in position to the gin-traps of the Tenebrionidae (Daggy, 1946, Hinton, 1946). However, instead of being heavily sclerotized, toothed, or otherwise ornamented as in the Tenebrionidae, the anterior and posterior edges seem rather soft. Although there is some question therefore whether these structures are true gin-traps, their gross appearance is highly suggestive; the anterior edge, on the posterior margin of a tergum, lies below the rest of the tergum and, when the abdomen is moved sideways, would seem to come in contact with the posterior edge formed by the anterior margin of the following tergum. Somewhat less well-defined structures located between some abdominal sterna may also be gin-traps. If so, this is the first time ventral ones have been observed for any beetle.

In describing the pupae, I have followed for the most part the format and points of comparison employed in my earlier papers on beetle pupae (Rozen, 1959, 1963). However, of necessity I have altered the style in some places to include new information that now seems pertinent to taxonomic studies on beetle pupae.

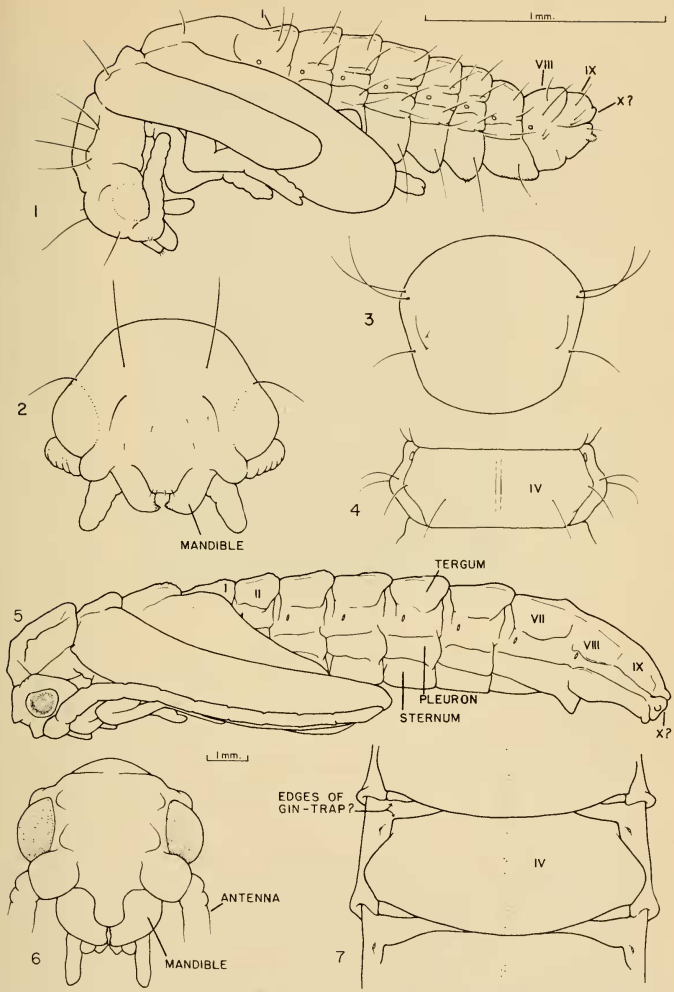
The specimens employed were kindly loaned through Dr. Donald M. Anderson by the United States National Museum, Washington, D. C.

Micromalthus debilis LeConte

(Figs. 1-4)

Total body length 2.0-2.3 mm.; body color whitish; shape (fig. 1) elongate, slender, somewhat laterally compressed, especially in region of basal abdonimal segments; body surface with widely scattered microscopic pubescence and with unpigmented, elongate, sharp-pointed setae (fig. 1), and without tubercles. Head (fig. 2) with several elongate setae; labrum with apical fine setae; mandibular teeth sharp-edged and sclerotized. Pronotum (fig. 3) with setae. Mesonotum (fig. 1) with pair of setae; each elytron without setae and short, not reaching femorotibial joint of hind leg. Metanotum (fig. 1) with pair of setae. All legs without setae. Abdomen (figs. 1, 4) without gin-traps but with unsclerotized, median, dorsal, longitudinal ridge; ventral surface microscopically asperate on median part of seventh sternum and perhaps (though to a lesser extent) on comparable parts of fifth and sixth sterna; paired, posteriorly directed prolongations of ninth sternum asperate. Fourth abdominal tergal sclerite (fig. 4) weakly sclerotized and not subdivided; tergum with pair of lateral marginal setae and with pair of discal setae; pleuron weakly sclerotized but represented as distinct lobe, bearing two elongate setae; sternum weakly sclerotized and bearing pair of elongate setae. Urogomphi absent.

Material: Six pupae, 13 larvae, Jackson Island, Maryland, July 16-17, 1913, larvae of all forms, paedogenetic form, and pupae *ex* "red-rotten" oak (H. S. Barber). One pupa, two larvae, near Plummers Island, Montgomery County, Maryland, June 28, 1913, in pine timber of old lock gate, lock 13, C. & O. Canal (E. A. Schwarz and H. S. Barber).



Figs. 1-4, female pupa of *Micromalthus debilis LeConte;* fig. 1, entire pupa, lateral view; fig. 2, face; fig. 3, dorsal surface of pronotum; fig. 4, fourth abdominal segment, dorsal view. Figs. 5-7, pupa of *Cupes concolor* Westwood; fig. 5, entire pupa, lateral view; fig. 6, face; fig. 7, fourth abdominal segment, dorsal view. Scales refer to figs. 1 and 5.

Cupes concolor Westwood

(Figs. 5-7)

Total body length approximately 16.0 mm.; body color whitish; shape (fig. 5) elongate, slender, cylindrical; body surface without microscopic pubescence, elongate setae, and tubercles, although with conical projection on face (fig. 6) corresponding to those of adult. Labrum without setae; mandibular teeth blunt and faintly pigmented though apparently not sclerotized. Each elytron long, extending well beyond (though obscuring) femorotibial joint of hind leg. Apparent, paired, dorsolateral gin-traps (figs. 5, 7) between metathorax and first abdominal tergum and between all abdominal terga except seven and eight and eight and nine; less well-defined ventrolateral gin-traps between sterna three and four, four and five, and (at least on some specimens) five and six; abdomen with unsclerotized, median, dorsal, longitudinal ridge; this ridge, as well as other projecting ridges on body microscopically asperate (asperities too small to be shown in figure 5) but asperities not found on median parts of abdominal sterna. Fourth abdominal tergal sclerite (fig. 7) distinct though not heavily sclerotized, and not subdivided; pleuron represented as distinct rectangular plate; sternum distinct though not heavily sclerotized. Urogomphi absent though paired, laterally projecting tubercles found on apparent tenth segment.

Material: Seven pupae, two larvae, one adult, Virginia shore below Plummers Island, Montgomery County, Maryland, June 7, 1913 (E. A. Schwarz and H. S. Barber). Three pupae, four larvae, same except larvae, pupae, and adults in decaying oak filled with fungus, *Daedalia quercina*. One pupa, six larvae, Connecticut, Hopk. U. S. 10081M; one pupa, Dead Run, Fairfax County, Virginia, opposite Plummers Island, Maryland, June 7, 1913, pupa in rotten log (put in alcohol June 12, 1913) (Pierce, E. A. Schwarz and H. S. Barber).

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